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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **A method and an apparatus for continuously purifying an oxygen-containing gas of its combustible contaminants.**

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(73) Proprietor : **Haldor Topsoe A/S**
Nymollevej 55
DK-2800 Lyngby (DK)

(72) Inventor : **Nielsen, Kai Hasse**
Lundemosen 63
DK-2670 Greve Strand (DK)
Inventor : **Jensen, Frands Erling**
Gadetoften 4 Ganlose
DK-3660 Stenlose (DK)

(74) Representative : **Rotne, Jens Styrup et al**
c/o Internationalt Patent-Bureau Hoeje
Taastrup Boulevard 23
DK-2630 Taastrup (DK)

EP 0 365 262 B1

Table 1

Test No.	X1 g acetone/Nm³	t1 minutes	G5 Nm³/h	X2 mg C/Nm³
11	0.5	3	0	40
12	0.5	6	0	25
13	2	3	15	150
14	5	3	30	300
15	5	6	25	200

When operating the same apparatus according to the method of the invention the results shown in Table 2 were obtained. Here, t1 is the time (minutes) in each of phases 1 and 3 between valve readjustments and t2 is the time (minutes) in each of phases 2 and 4 between valve adjustments:

Table 2

Test No.	X1 g acetone/Nm³	t1 minutes	t2 minutes	X2 mg C/Nm³
21	0.5	3	0.1	20
22	0.5	6	0.2	10
23	2	3	0.5	15
24	2	6	0.8	8
25	5	3	1	8
26	5	6	1.8	6

It is realized directly from Table 2 that the scavenging procedure according to the invention causes a strong reduction of the contents of remaining unburnt components in the purified offgas, especially in case of high concentrations in the feed gas. In test No. 22 though, it was necessary to supply additional heat to space 15 by means of the burner in order to maintain a temperature of 350°C in the catalyst.

The time it takes to readjust the four valves to reverse the direction of flow in the above apparatus is below 1 second and does not cause any appreciable throughput of unburnt acetone. In apparatuses for larger amounts of gas, valves are needed which have a larger diameter and longer time for the readjustment, whereby the use of the method of the invention will be still more advantageous.

It is expected that the method and the apparatus according to the invention will be useful in factories producing big amount of offgases polluted with organic compounds, especially organic solvents from, e.g., surface finishing, printing establishments and lacquering; and in purifying malodorous and/or harmful gaseous substances, e.g. from organic syntheses, plastics industries, water purification or food or feed industries.

Claims

1. A method for the substantially continuous purification of an oxygen-containing gas containing combustible contaminants by a thermal and/or catalytic combustion process during which at least part of the heat of combustion is recover d by a r generative heat xchang in two stationary, substantially identical zones comprising solid heat exchang material and separated by a combustion chambers, in which method the air to be purified flows through both of the h at exchang zones and the direction of flow through the zones is reversed periodically such that the two zones are alternat ly heated and cooled in periods of 0.1 to 60 minutes, characterized in that th purified gas stream in the first 1% to 50% of ach period is divided into

two part-streams of which one is passed directly from the combustion chamber to a recipient and the other is passed through the heat xchange zone being heated and from there is recycled and combined with the untreated gas stream which is conducted to the heat exchange zone being cooled.

2. A method as claimed in claim 1, characterized in conducting the gas passing the heat exchange zones through two substantially identical layers of a combustion catalyst, one such layer being placed in connection with either of the heat exchange zones.

3. A method as claimed in claim 1, characterized in that the contaminated gas is diluted with air if it contains more than 15 g of combustible substances per Nm^3.

4. A method as claimed in claim 1, 2 or 3, characterized in that the part-stream passed from the combustion chamber is bigger than the recycled part-stream.

5. A method as claimed in claim 1, characterized in that the length of the periods is 0.1-60 minutes.

6. A method as claimed in claim 1, characterized in that the length of the periods is 1-30 minutes.

7. An apparatus for carrying out the method defined in claim 1, provided with
a substantially symmetrical reactor having a central combustion chamber (15) with a source of heat (16) and a line (19) provided with a valve (5) for discharging the purified gas to a recipient (22),
two identical heat exchange layers (10,11) being placed close to the combustion chamber (15), one at each side thereof,
an end chamber (14) being placed adjacent each heat exchange layer (10,11) at the side thereof farthest from the combustion chamber (15),
said end chambers each being connected with a line (17,18) provided with a valve (1,2) for admitting untreated gas from a common supply line (23) and a line (20,21) provided with a valve (3,4) for discharging the purified gas to the recipient (22),
characterized in that a recycle line (24,25) provided with a valve (6,7) leads from each end chamber (14) to the common supply line.

8. An apparatus as claimed in claim 7, characterized in that a catalyst layer (12,13) is placed in extension of either heat exchange layer (10,11), at the side thereof adjacent the combustion chamber (15).

Patentansprüche

1. Verfahren zum im wesentlichen kontinuierlichen Reinigen eines sauerstoffhaltigen Gases, das brennbare Verunreinigungen enthält, durch einen thermischen und/oder katalytischen Verbrennungsprozess, bei welchem zumindest ein Teil der Verbrennungswärme durch einen rückgewinnenden Wärmeaustausch in zwei stationären, vorwiegend identischen Zonen, umfassend festes Wärmeaustauschmaterial, und Abscheiden in einer Verbrennungskammer, regeneriert wird, bei welchem Verfahren die zu reinigende Luft durch beide Wärmeaustauschzonen strömt und die Richtung des Durchströmens durch die Zonen zeitweilig umgekehrt ist, sodass die zwei Zonen in Zeitspannen von 0,1 bis 60 Minuten abwechselnd erhitzt und abgekühlt werden, dadurch **gekennzeichnet**, dass der gereinigte Gasstrom in den ersten 1% - 50% einer jeden Zeitspanne in zwei Teilströme geteilt ist, wovon der eine von der Verbrennungskammer direkt zu einem Empfänger geleitet wird, und der andere durch eine Wärmeaustauschzone geleitet und dabei erhitzt wird, und von dieser Zone rückgeführt und mit dem unbehandelten Gasstrom vermischt wird, welcher zu der Wärmeaustauschzone, die unter Abkühlung ist, geleitet wird.

2. Verfahren nach Anspruch 1, dadurch **gekennzeichnet**, dass das durch die Wärmeaustauschzonen geführte Gas durch zwei im wesentlichen identische Schichten eines Verbrennungskatalysators geleitet wird, wobei die eine Schicht in Verbindung mit jeder der Wärmeaustauschzonen plaziert ist.

3. Verfahren nach Anspruch 1, dadurch **g kennz ichnet**, dass das verunreinigte Gas, falls es mehr als 15 g brennbare Substanzen pro Nm^3 nthält, mit Luft verdünnt wird.

4. Verfahren nach Anspruch 1, 2 oder 3, dadurch **gekennz ichn t**, dass der von der Verbrennungskammer kommende Teilstrom grösser ist als der rückgeführte Teilstrom.

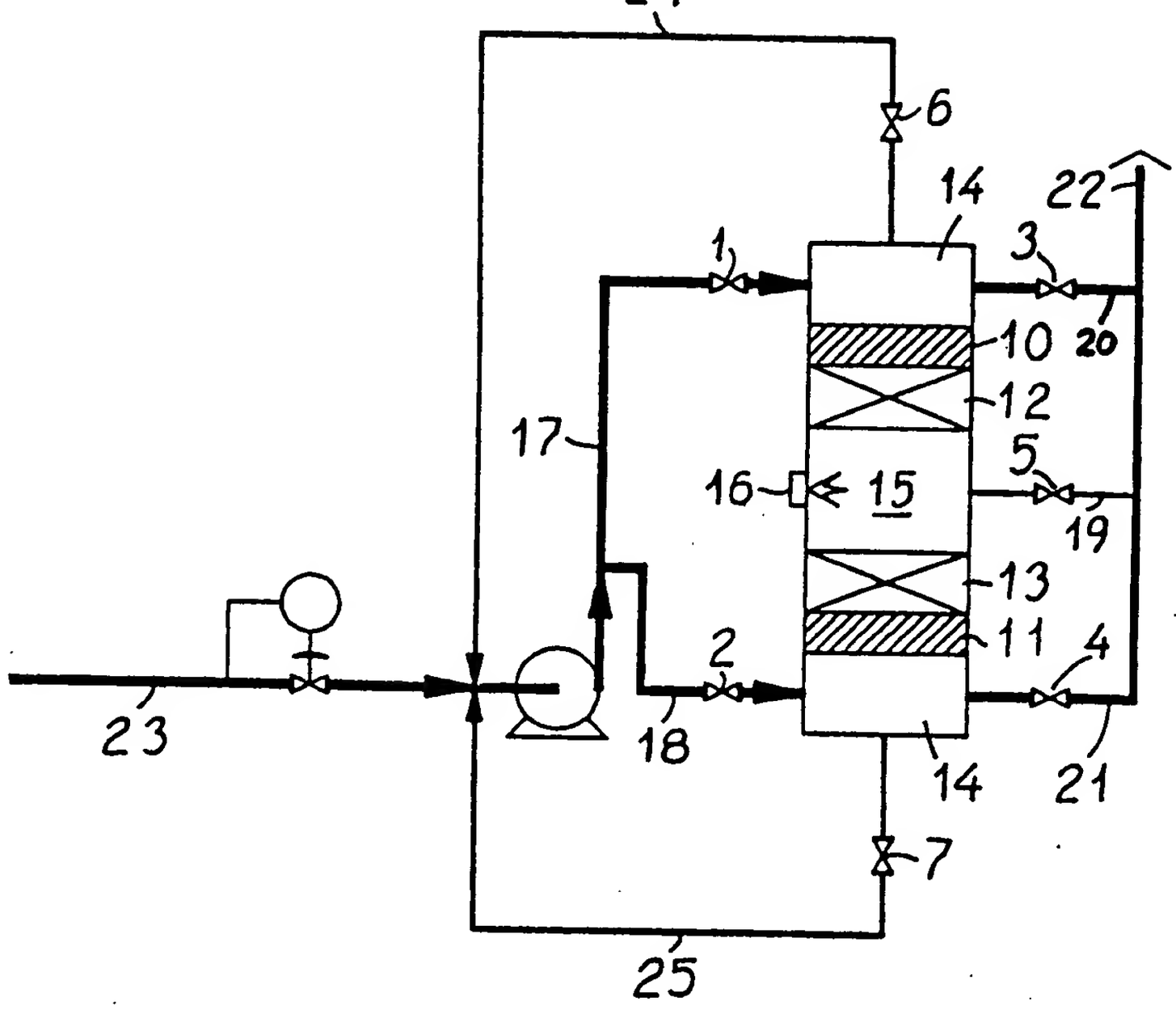

FIG. 2